U.S. ARMY CORPS OF ENGINEERS

Howard Hanson Dam
13 JULY 2009

Howard Hanson Dam

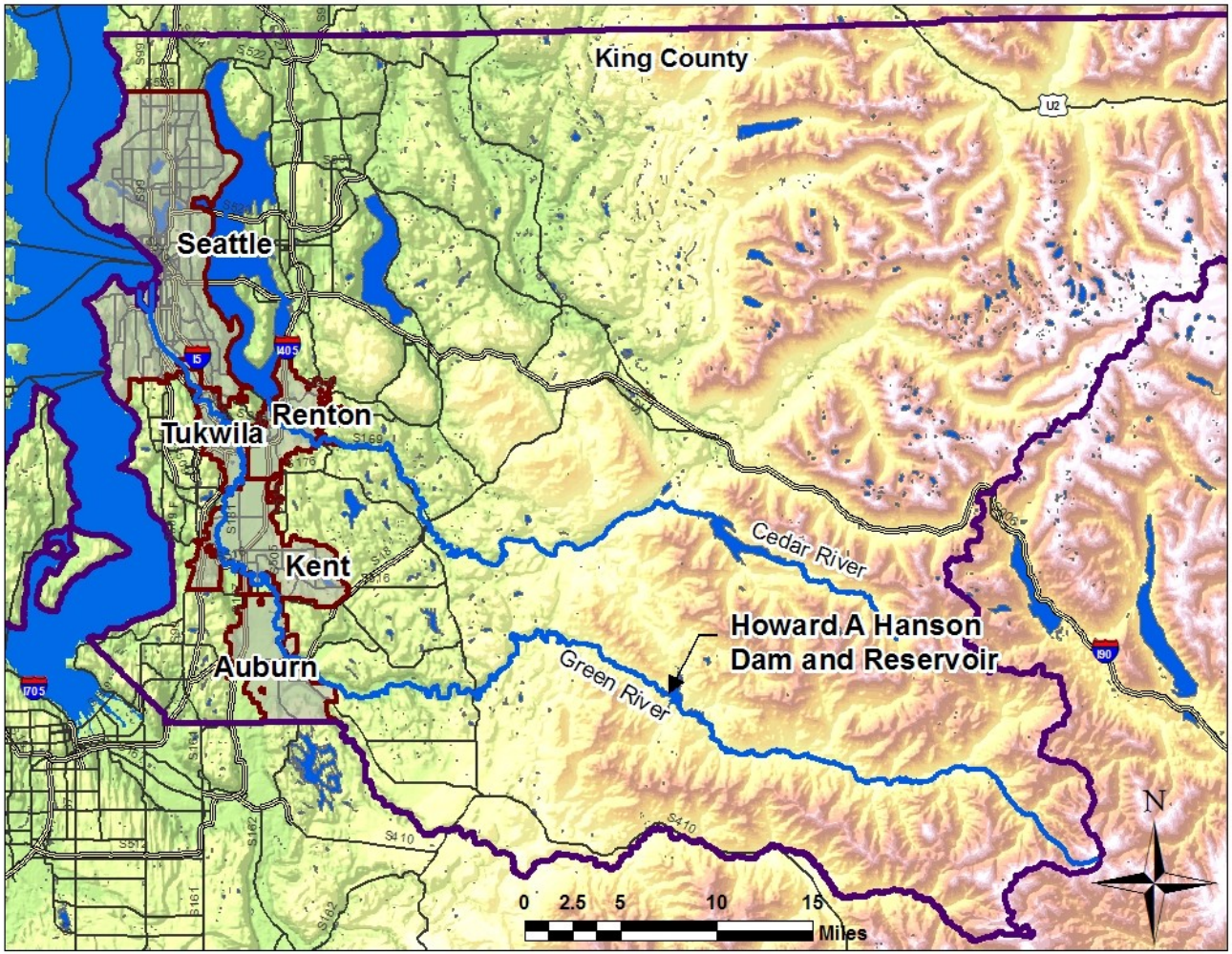
Right Abutment Integrity Update

- Howard Hanson Dam overview
- The January 2009 flood
- January Flood issues
- Investigative Actions
- Findings
- Schedule
- Preparedness

Howard Hanson Dam Background

- **Construction completed in 1962.**
- **Drainage Tunnel completed 1969**
- **Howard A. Hanson Dam is located on the Green River in King County at RM 64.**
- **Project purposes include flood risk management, low flow augmentation, M&I water storage, and ecosystem restoration.**
- **The dam is an earth and rock fill structure with a sand core and gravel drain. Outlet works on the left bank consist of an approach channel, an intake structure, a 19 foot diameter horseshoe concrete - lined tunnel, a stilling basin, and an auxiliary 48 inch diameter bypass pipe. A gated spillway on the left abutment has two 45 by 30 foot tainter gates and a concrete spillway chute**
- **Grout curtain installed 2002**

Green River Watershed

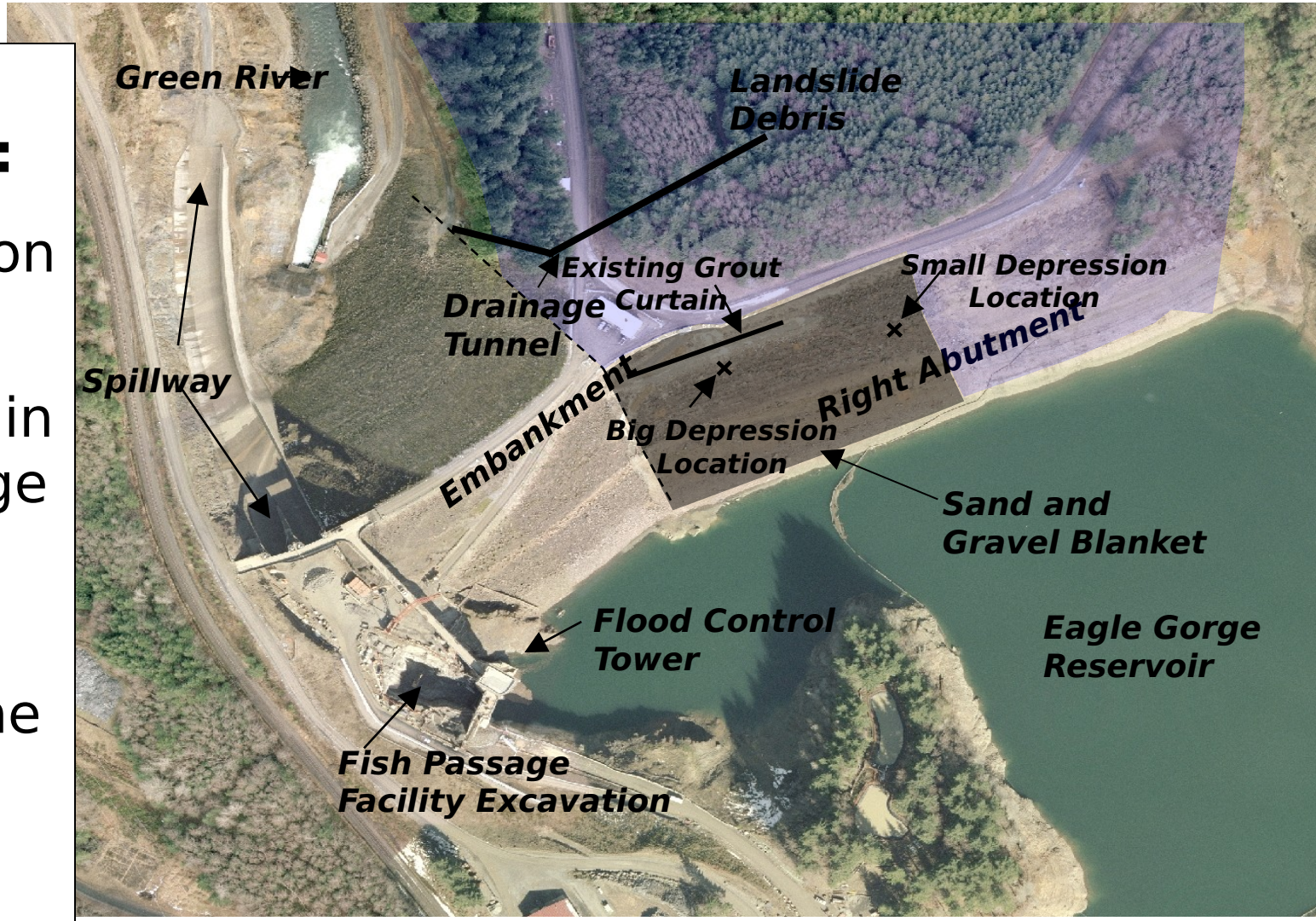


January 2009 Flood

- Inflow peaked at 30,500 cfs; outlet works closed
- Pool of Record - elevation 1,188.9 feet
- Maximum outflow ~ 8,000 cfs; local inflow ~ 6,000 cfs
- Outflows managed to keep Auburn <12,000 cfs

District Concerns:

- Depression formation
- Turbidity in the seepage tunnel
- Water levels in the short path seepage area

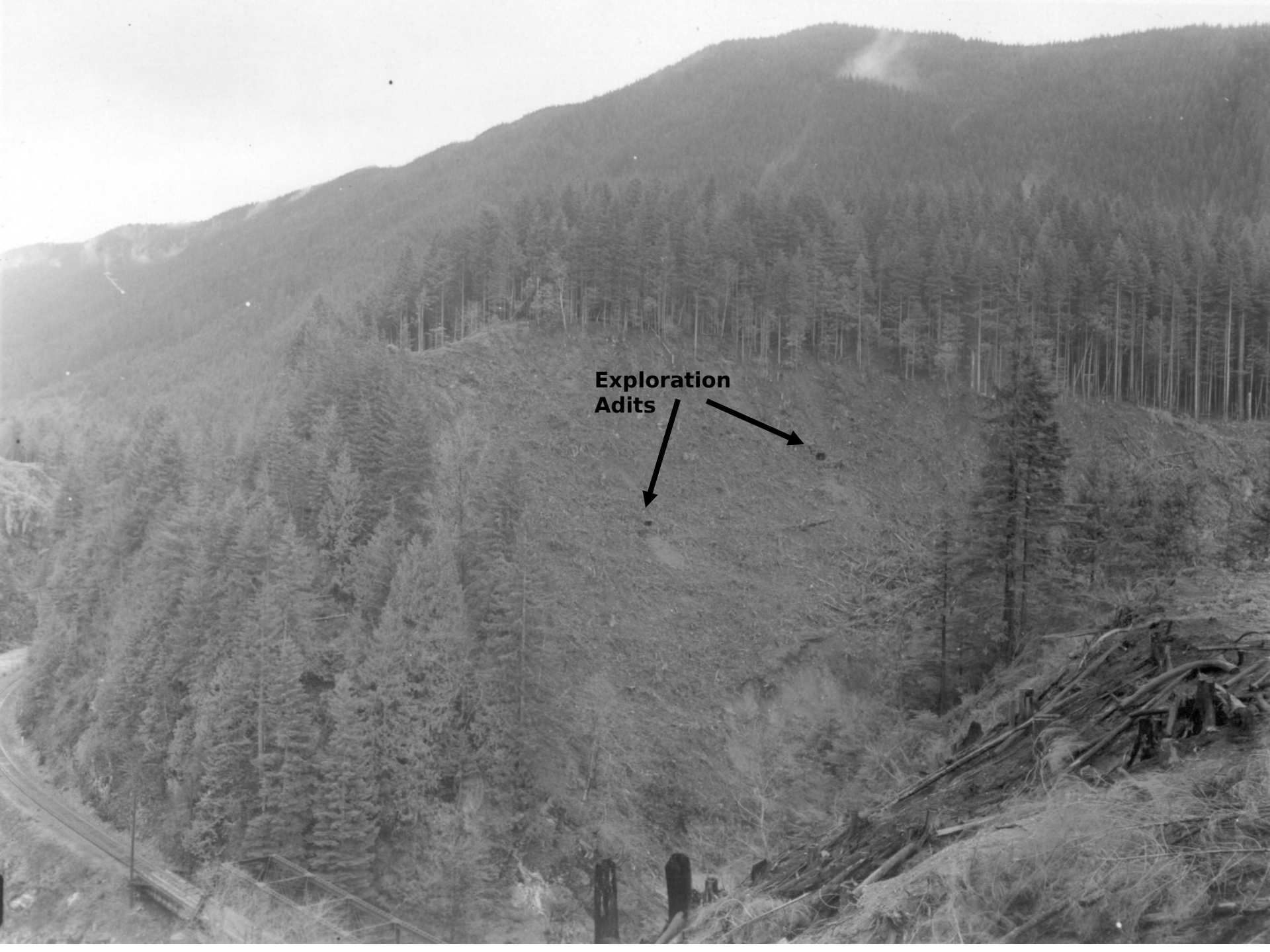


TW-37
TW-35
TW-34

4 QT
3.5 QT
3 QT
2.5 QT
2 QT
1.5 QT
1 QT
5 QT

Small Depression Excavation

Large Depression Excavation


Exploration
Adits

Investigative Actions

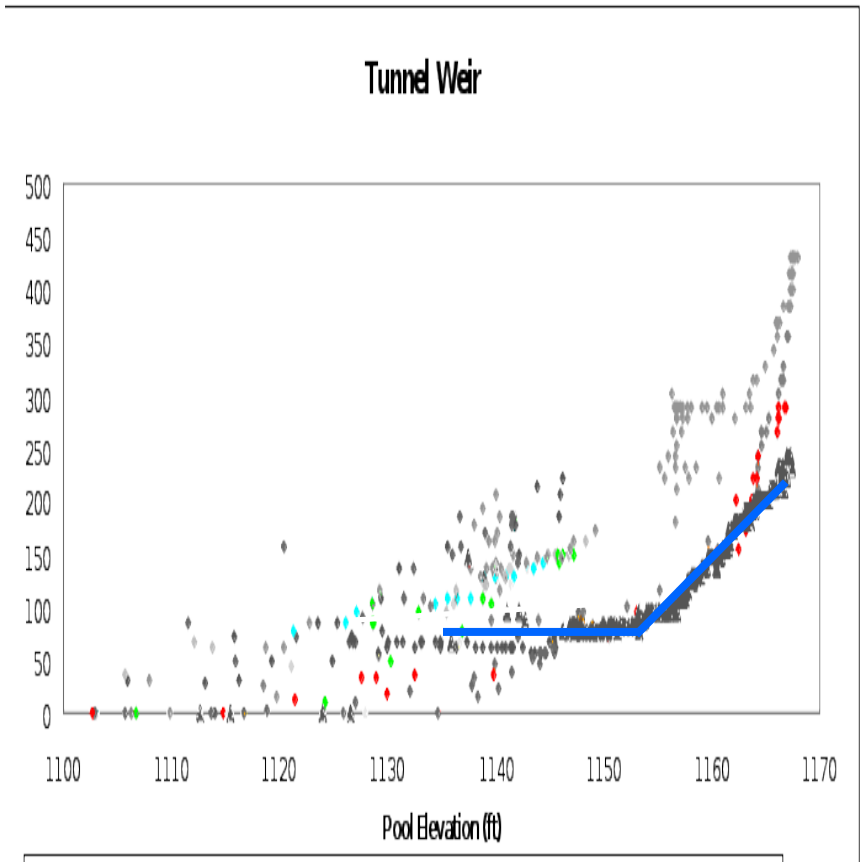
- Immediate drawdown after depressions and higher than expected seepage seen in January
- Conducted dye tests
- Implementation of elevation restrictions
- Increased monitoring and instrumentation
- Excavated the large and small depressions
- Flood risk modeling and mapping, river bank elevation mapping
- Conducted a controlled conservation pool raise:
  - Held pool at specific elevations 1147, 1157, 1167
  - Installed instruments, conducted tests and analysis of structure at previously studied elevations

Findings

- Depressions: Small and large depressions not likely indicative of an open seepage conduit – rock deterioration and adit collapse.
- Turbidity and Groundwater Readings: Conducted controlled pool raise; additional instrumentation, dye tests, geophysical surveys, and modeling; empanelled nationally-known experts.
- Conservation pool analysis – observed higher seepage rates and rates of increase above elevation 1,155 than at lower elevations

2009 Conservation Test Pool

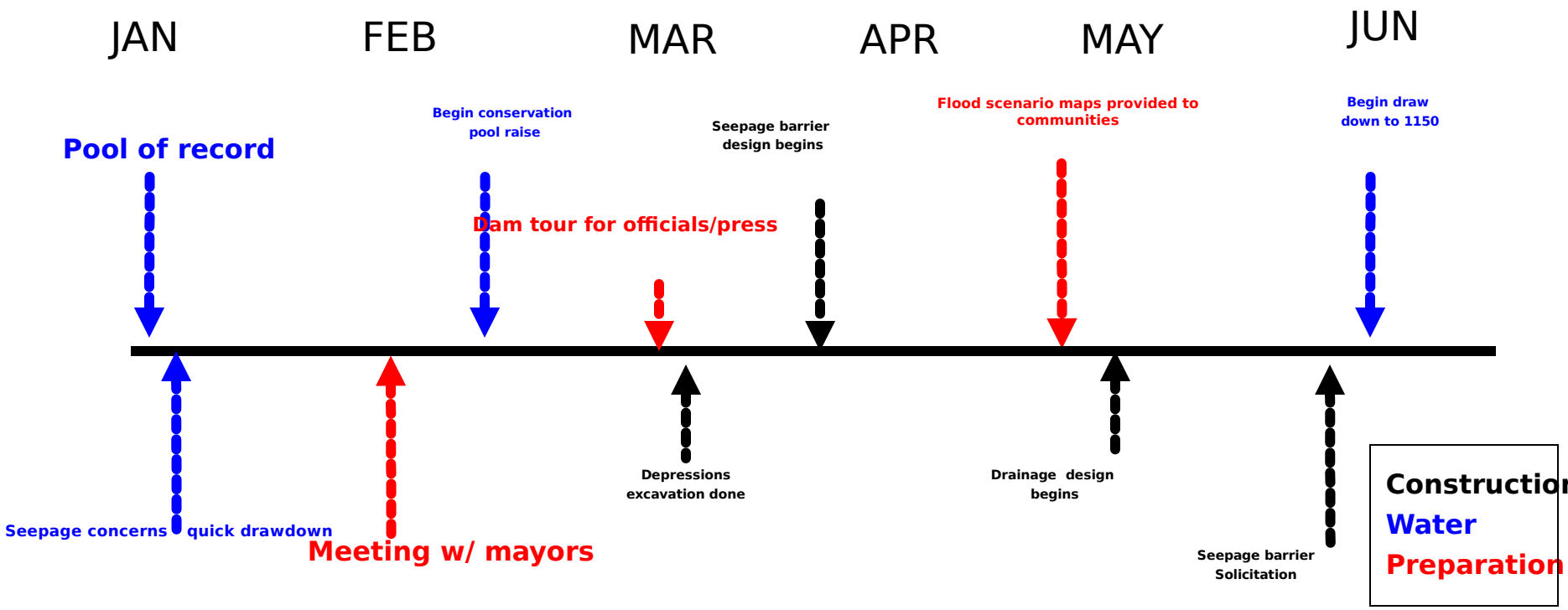
- Preliminary tunnel and groundwater data consistent with previous conservation pools
  - Flow through abutment dramatically increases above EL 1155
  - Rate of flow increases from 1.2 gpm/ft pool rise to 12.5 gpm/ft pool rise
  - Drain 37 begins to flow at El 1157
  - Rate of water level rise in some piezometers increases
  - Except,
    - Dye exits to drainage tunnel in 90 minutes at elevation 1157



Right Abutment Integrity

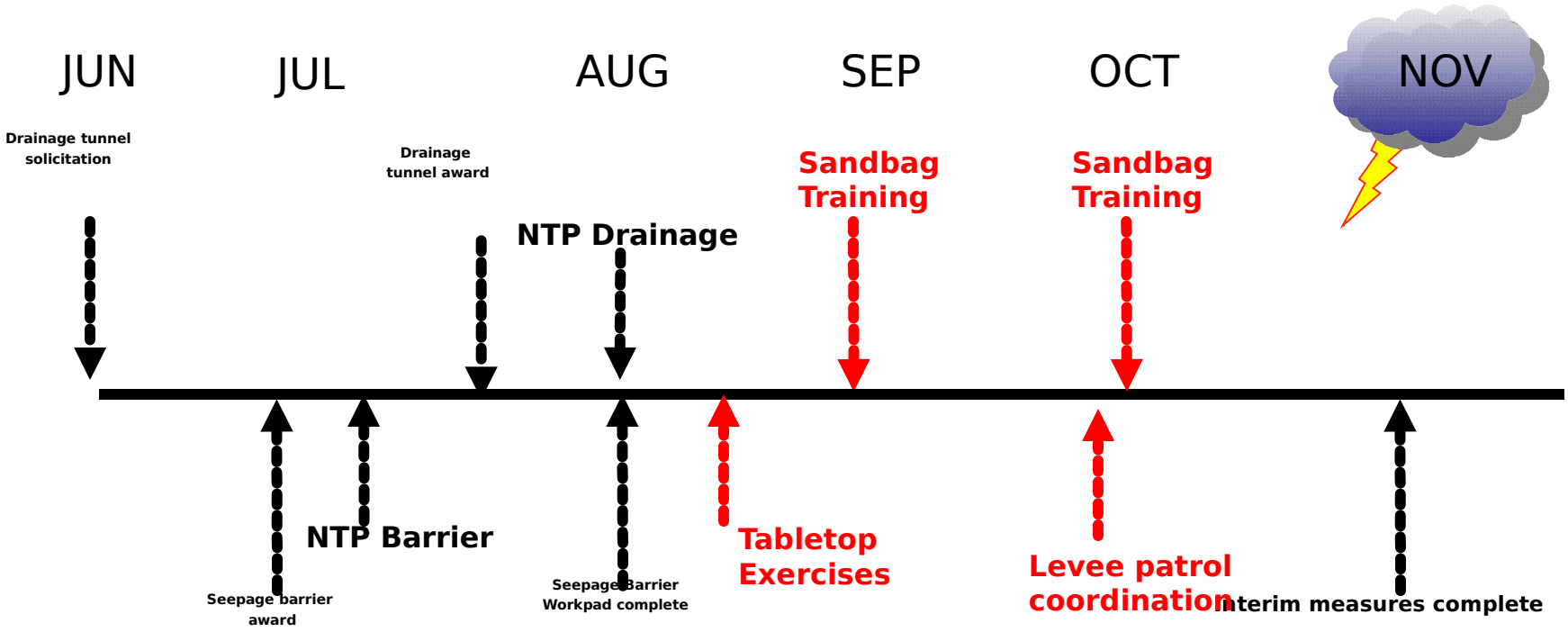
- Interim Measures Completed
  - IRRMP completed and approved 29 May 2009
  - Three nationally-known experts empanelled
  - Initial exploration complete; additional options awarded
  - Seepage barrier contract awarded to Nicolson Construction; Preconstruction meeting 14 July
    - ARRA-funded (funds in-house)
    - $8.445,000 base
    - $8,878,380 total
    - Target completion date 01 November 2009
  - Drainage Tunnel improvements solicitation closes 14 July 2009
    - Target award date 26 July 2009
    - ARRA-funded
    - Target completion date 01 November 2009
  - Developing 3-D model for tool to evaluate interim measures effectiveness
  - Inundation maps completed and distributed to local EM functions
    - Table top exercises being coordinated through NWS EM
  - Aggressive public outreach and information sessions on going

Schedule



Pool elevation in feet above sea level

Schedule



Pool elevation in feet above sea level

Next Actions

- Construct the seepage barrier – completion target 01 November 2009
- Drainage improvement contract expected to be awarded by end of July – completion target 01 November 2009
- HHD Long-Term Study initiated
  - $400,000 initial funding received and distributed
  - $520,000 additional Construction General wedge funding received 7 July 2009
  - Team reviewing process to expedite approval for design and FY11 construction

Preparations

- Levee rehabilitation
- Potential advanced measures
- Planning and preparedness activities with communities
- Water Management
- Communication

Green River Levee Rehabilitation

- Horseshoe Bend Levee:
  - Contract Award 8 July
  - Construction start 13 July
  - Total project cost: $5M
- Desimone - Briscoe School Levee
  - Construction scheduled for this summer
  - Engineering evaluation and PIR in-progress
  - Additional damage identified – real estate and 401 issues
  - Risk is high of not making summer construction work window
  - Preparing flood response plans as a contingency
- Tukwila Levee
  - Construction originally scheduled for this summer
  - Engineering evaluation: Levee not substantially damaged – observation planned during flood season
  - Preparing flood response plans as a contingency
- Gallis Levee
  - Construction scheduled for August
  - Low risk of missing in-water work window
  - Preparing flood response plans as a contingency
- Reddington Levee
  - Construction scheduled for Summer 2010
  - Preparing flood response plans as a contingency

Advance Measure Authority

The Corps can support locals with emergency actions that are implemented prior to flood season

Potential Projects

- Planning assistance
- Pre-placement of flood response materials
  - Sandbags, water control structures, pumps, etc.
- Assistance with raising low areas and re-enforcing weak spots

Green River Coordination – Events Calendar

July 2009

- 13th – HHD Executive Briefing
  Agency Lead: USACE
- 20th – King County Executive Tabletop Exercise (Internal)
  Agency Lead: King County

August 2009

- TBD – Vulnerability Map Presentation
  Agency Lead: King County
- TBD – Kick-off Tabletop Exercise (USACE, National Weather Service, etc.)
  Agency Lead: USACE
- 18-19th – USACE EOC Exercise (Internal)
  Agency Lead: USACE
- 25-26th – Tabletop Exercise and Levee Walk (tentative date)
  Agency Lead: City Planning Group (?)

September 2009

- 15th – Sandbag training
  Agency Lead: City Planning Group (?)
- TBD – Individual City Planning Exercises
  Agency Lead: Cities

2009/2010 Flood Season

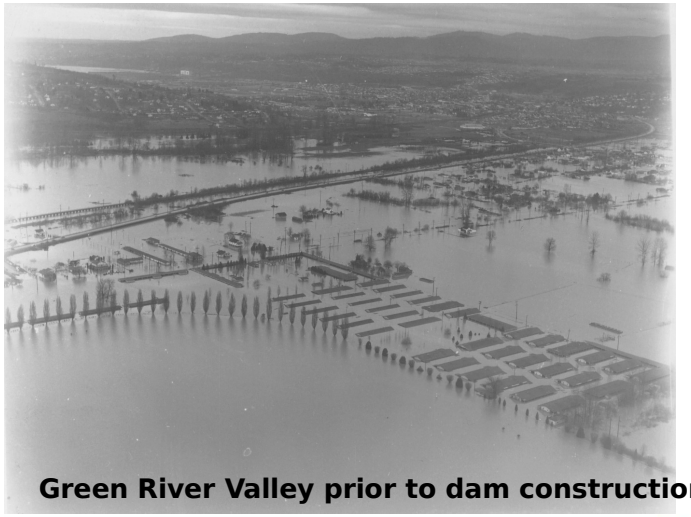
- Ongoing – Sandbag trainings & Community outreach
  Agency Lead: City Planning Group (?)
- Ongoing – Levee Patrol Coordination
  Agency Lead: All

Water Management

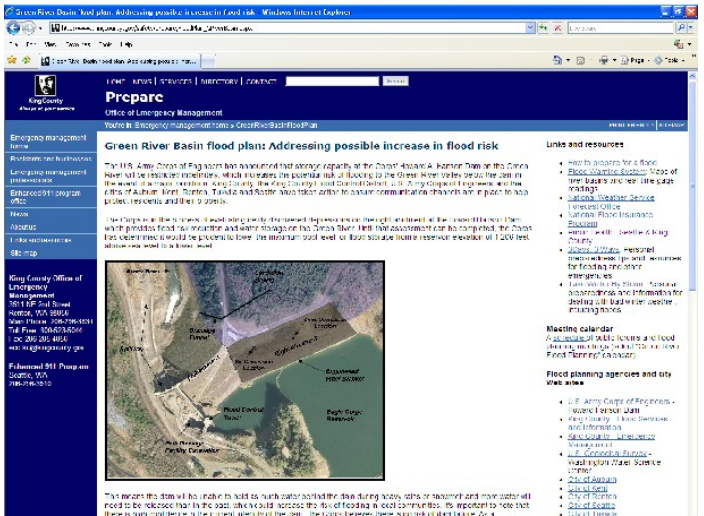
- Flood season typically begins in early November
- El Nino, which is forecasted for the upcoming winter, suppresses the intensity of major flooding in Western Washington
- Howard Hanson Reservoir will be drafted to empty by the beginning of the flood season
- Coordination is occurring with key agencies (i.e., National Weather Service) and stakeholders in advance of flood season to enhance preparedness

Communicating Flood Risk

- Green River Team – Cities, county, agencies, Port – partnering to share information
- Public meetings in Kent, Tukwila, Auburn, Renton, King County
- Joint chambers of commerce meeting this summer
- Websites – Corps and County
- Local Access TV - King County, Valley
- Direct mail from local governments to potentially affected addresses
- King County direct mail campaign July



Green River Valley prior to dam construction


Prepare
Office of Emergency Management
Green River Basin flood plan: Addressing possible increase in flood risk
Links and resources
Meeting calendar
Flood planning agencies and city Web sites

Questions?